



INTER-SERVICE/INDUSTRY TRAINING, SIMULATION, AND EDUCATION
CONFERENCE (I/ITSEC) '99 AFTER ACTION REPORT (AAR) - JOINT TRAINING
EVENT (JTE) "OPERATION DESERT RATS"



Prepared by

U.S. Army Simulation, Training, and Instrumentation Command

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Point of Contact: Bernard Gajkowski
Principal Investigator
STRICOM
SETM Division
(407) 384-3681
e-mail: bernard_gajkowski@stricom.army.mil

"Training Tomorrow's Leaders with Today's Warfighters Using Simulations of the Next Millennium"

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EVENT (JTE) OPERATION DESERT RATS

1. General. This After Action Report represents the unedited input from the participating organizations. As such, information contained in this report does not necessarily represent the views of the entire body of participants.
2. Executive Overview. I/ITSEC '99 was conducted 29 November - 2 December 1999. During the conference, the Simulation, Training, and Instrumentation Command (STRICOM), U.S. Army, led a 24-member Military, Industry, and Academia coalition in the conduct of a Joint Training Event (JTE) code-named "Operation Desert Rats."

Participation by coalition members was on a volunteer basis with each using its own resources. The JTE consisted of an American Joint Task Force (JTF) defending a fictitious nation (Westland) against an attacking neighbor designated Eastland. The actual setting was the National Training Center (NTC) in Southeast California extending Westward 200 miles into the Pacific and Southward to San Diego. The deployed JTF included air, sea, and ground forces. All American military services participated in action against Eastland Opposing Forces (OPFOR) which employed Soviet equipment. Simulations on the I/ITSEC Exhibit Floor were used to replicate the battlefield. Each simulation was controlled by actual military Warfighters. A Joint Exercise Control Group (JECG), assisted by the U.S. Joint Forces Command (USJFCOM), was established in the Army booth and directed the exercise. Over three days, the exercise was conducted in four 30-minute "Battle Vignettes" designated as Counter-Recon/Combat Air Patrol (CAP), Defend in Sector, Movement to Contact, and Meeting Engagement. Post Event Debriefs were held after each vignette to discuss lessons learned and share information with conference attendees. The High Level Architecture (HLA) was used as the basis for establishing interoperability between simulations in a Local Area Network (LAN) for those participating simulations deemed compliant. The STRICOM HLA Gateway with "Bridge Federate" was employed to allow interoperability between HLA and DIS compliant simulations.

3. Joint Training Event (JTE) Objectives.

- a. Demonstrate that selective technology can increase realism in a Joint Training Exercise (JTX) using multi-service virtual as well as constructive simulations so as to enhance future training and mission rehearsals for Warfighters.
- b. Demonstrate that Joint distributed training and mission rehearsal can be achieved through the application of existing and emerging simulation interoperability standards (HLA and DIS PDUs).
- c. Demonstrate that multiple organizations can work together in a collaborative developmental environment to achieve interoperability.

4. Commander's Intent. Demonstrate that I/ITSEC is an environment that can be leveraged by the military-industrial coalition to evaluate new simulations, Warfighting applications, improve interoperability knowledge, and conduct limited Joint training and mission rehearsals for participating Warfighters.

5. General Executive-Level Lessons Learned.

- a. Inter-service and industry cooperation was a key factor in the successful conduct of Joint Training Event (JTE), Operation Desert Rats.
- b. Simulators and simulations successfully supported the demonstration of limited, improved Joint training.
- c. The I/ITSEC "environment" (Exhibit Hall with simulations) successfully supported the conduct of analysis of the HLA.

d. HLA successfully proved that it supports the achievement of interoperability between simulations. However, work still needs to be achieved and documented with the RTI. Specifically, I/ITSEC can be a "leveraged" environment where the analysis of federation and RTI behavior/performance can be achieved at a "cost-saving" to the military if a sponsor can be established and a small investment executed.

6. General Executive-Level Accomplishments.

a. It is believed that JTE Operation Desert Rats was the first time that real-time Close Air Support (CAS) operations between the Army, Air Force, Navy, and Marines was conducted using virtual simulators from all services.

b. First time that Joint deployed Air Operations were conducted using virtual simulators.

c. First time that a Combat Information Center (CIC) simulation was linked to Army, Air Force, and Marine simulators in the conduct of multiple operations.

d. It is believed that JTE Operation Desert Rats was the first time that a major Joint training event was successfully executed using simultaneously, the "High Level Architecture (HLA) and Distributed Interactive Simulation (DIS)" compliant simulators from all services through the employment of the STRICOM Gateway federation.

e. The primary center of military simulation development is in the Orlando, Florida area. A significant number of Industry software engineers develop simulations for all services and the joint community. In the development, the software engineers continuously take into account HLA through adherence to the government rules and through compliance testing. However, many of the software engineers never have the opportunity to participate in a stressful military exercise, such as a STOW, where multiple simulations and simulators are inter-operating in a LAN or WAN. Operation Desert Rats provided that missing experience for the "Orlando based software engineers." The experience resulted in an enrichment of their education and provided many lessons learned that would never have been realized for many of the Industry personnel.

7. Participating Organizations.

a. Joint Commands. U.S. Joint Forces Command (USJFCOM).

b. Army. U.S. Army Materiel Command (STRICOM) and U.S. Army Training and Doctrine Command (National Simulation Center, Infantry School, Ranger IOBC, and Intelligence Center).

c. Navy. NAWCTSD.

d. Marines. USMC Program Office.

e. Air Force. USAF TSPG, AFRL, and AFAMS.

f. Industry. NTSA, I/ITSEC Planning Committee, AcuSoft, The Boeing Company, DSCI, Litton TASC, Lockheed Martin Information Systems, MetaVR, Motorola, SGI, SAIC, and Virtual Technology Corporation (VTC).

g. Academia. University of Central Florida (UCF) Army Reserve Officer Training Corps (ROTC) and UCF's Institute for Simulation and Training (IST).

8. JTE Operation Desert Rats Background. For detailed background information on the planning, general preparation, meetings, technical preparation, costs, exercise (scenario) development, and vignettes, see various documents contained on the STRICOM web site. Paragraphs 9 through 20 of the remaining portion of this After Action Report (AAR) contains specific lessons learned from the participants. The lessons learned represent the collective input of the participating military, industry, and academic collaborates in Joint Training Event (JTE), Operation Desert Rats. Specific Lessons Learned categories are broken down into the following:

- a. JTE Operation Desert Rats Pre-Event Planning and Preparation (para 9).
- b. Overall Scenario and Vignette Development (para 10).
- c. HLA and DIS Technical Preparations (para 11).
- d. JTE Exercise C2 At I/ITSEC (Warfighting, Training, and Technical) (para 12).
- e. Vignette #1 (Counter-Recon / Combat Air Patrol) (para 13).
- f. Vignette #2 (Defense / Rear Area Operations) (para 14).
- g. Vignette #3 (Battlefield Prep & Movement To Contact) (para 15).
- h. Vignette #4 (Meeting Engagement) (para 16).
- i. Communications (para 17).
- j. Post Event Debriefs, Closing Ceremony, and Awards (para 18).
- k. Terrain and Visual Databases (para 19).
- l. Resource Management (para 20).

9. Specific Lessons Learned -- JTE Operation Desert Rats Pre-Event Planning and Preparation.

- a. Planning and preparation must be commenced one year out.
- b. A small "Core Planning Cell" must be established at the outset. It must be prepared to devote daily activity to the preparation of the JTE with each member providing about one-quarter man-year of effort. At a minimum, the Core should consist of the Project Director, Technical Lead, Terrain Database Lead, Scenario Lead, Exercise Control Lead, Communications SME, I/ITSEC LNO, Military SME (Field Grade Officer), and Project Coordinator. These members should meet on a weekly basis.
- c. Monthly meetings of 100% of the participants (in person or via VTC) must be held to ensure timely coordination and working of issues.
- d. Participants must determine their level of involvement within the first quarter and obtain a firm commitment from a decision-maker.

e. The "Commander's Intent, Objectives, and Goals must be drafted within the first month by the Core Group and approved by the Commander of the Service conducting the JTE early on so as to facilitate planning and preparation and ensure all participants clearly understand the direction the coalition is embarking.

f. Within the first month, the Core Group must publish Milestones, Schedules of Events, and Responsibilities to all participants.

g. Participating Warfighters who will be using the simulations must be identified by name NLT one month prior to the JTE and briefed on the conduct of the exercise.

h. The lead Military Service should establish a web site to post information and should develop a Users Group on the Internet to allow for exchange of information by the participants in a "closed", private environment.

i. OPSEC approval should be gained within the first quarter.

j. The USJFCOM compiled a "JTE Controller's Handbook. It consisted of a description of the Joint Exercise Control Group (JECG), Control Plan and Measures, Model and Simulation Control and Architecture, Road To Crisis, Detailed Description of each Vignette, Vignette Matrix, Simulation Descriptions, Communications Plan, and JTE Battle Rhythm. This document proved invaluable to all participants in the planning and control of the exercise once at IITSEC. Continuous development of the Controller's Handbook is critical during planning to alleviate later problems during execution. The current handbook should be used as a template for next year. Also next year, add a paragraph to the Handbook outlining the overall event structure. Get the individual simulator descriptions earlier next time. Make them shorter and write them in "plain English" not a plethora of jargon. Keep descriptions as a separate annex versus being included in the general handbook. A well designed Master Scenario Events List (MSEL) matrix will help eliminate potential problems during execution and will ensure that vignette operations are properly phased to showcase each individual simulator and eliminate "dead air" during the events. The Handbook was a key document (THE ROADMAP) that held everything together. Its Communications Plan had flexibility to accommodate all tactical and control requirements. The Handbook provided a foundation for workarounds "on the fly" that worked well during the JTE. The Handbook was critical for vignette mission pre-briefs. The Vignettes Matrix provided the basis for activities to be spaced which allowed sufficient time to feature all the individual simulators. It provided the time-phased structure so that when communications were lost, the vignette could continue. It was flexible enough to allow events to be developed "on-the-fly" (such as additional air-to-air engagements).

k. All participants need to be at the early Desert Rats Workshops, especially military operations personnel. This would have eliminated numerous questions and ensured uniformed "buy-in" at the early stages of planning.

l. Periodic Workshops are required. Each was excellent and should be attended by all participants. After Workshop #2, each was divided into operational and technical syndicates, which appeared to work very well. This arrangement allowed technical and operational members to focus on their area of expertise. It also was very useful having a USJFCOM operational person in the technical group. Need to have a technical person in the operations group next time for liaison. The continuity and working relationships that were formed in the Workshops paid tremendous dividends during execution. Involvement of the same personnel (operational and technical) is critical throughout the entire planning and execution process. Need more operational military involved in the Workshops earlier. The Silicon Graphics (SGI) facility was an excellent location to use for Workshops.

m. The STRICOM Home Page was a very useful tool to keep all involved and informed. Central control of the Home Page appeared to work well. It made information available anywhere and at anytime which was very useful while on TDY.

n. USJFCOM personnel mix was very good. It consisted of three Senior Military Analysts (SMAs) and a Field Grade Officer. The team consisted of an Exercise Support Team Senior Military Analyst with air background, a Joint Exercise Control Group (JECG) controller SMA with sea background, a Scenario/MSEL SMA with an intelligence background and a uniformed USAF JW300 officer. An additional ground SMA may be useful next year if the event grows. Use of resident Joint Warfighting Center (JWFC) Support Team (JST) staff expertise during the planning phase worked well for this event.

o. Everyone must be aware of service and industry / company agendas early in the planning to minimize changes late in the development.

p. Outstanding cooperation between operational and technical people throughout the development and execution of the JTE. These were the most "mission oriented" technical personnel that USJFCOM has ever been associated with and it was very refreshing to work with such professionals! All participants were highly knowledgeable in their field of expertise.

q. USJFCOM needs to take advantage of new developments at I/ITSEC. Need to fully explore the emerging technologies available and bring some to the JTASC.

r. The JTE was not 100% IAW Joint Doctrine or Joint Tactics, Techniques, and Procedures (TTPs). However, USJFCOM's presence provided an element of Joint legitimacy that is very important for both this and subsequent I/ITSECs.

s. The JTE provided excellent public relations venue for USJFCOM and the services/industry participants benefited greatly from the Joint SME presence. However, this event was not a "free ride" and costs will probably rise as the complexity increases. Especially since the companies that provided manpower and resources "pro bono" this time, may not be willing to make such an investment every year.

t. Currently, there is no J4/7 equivalent (USJFCOM Joint Interoperability) for tactical level interoperability as it is primarily a service responsibility.

u. It is believed that the services benefited greatly from this JTE. However, there was no visible Joint Staff presence/involvement at I/ITSEC '99.

v. I/ITSEC provides the right forum to demonstrate the potential for interoperability training at the tactical level and at a reduced cost to the services, if it is allowed to grow. Who will manage this to bring out its full potential is still to be determined.

w. The USJFCOM Desert Rats personnel were resourced as direct support to STRICOM for this event (members were wearing STRICOM on their badges). Each learned an incredible amount from this exposure. The same cadre needs to be used for I/ITSEC 2000 to ensure the lessons previously learned are applied.

x. The USJFCOM Desert Rat support and the USJFCOM booth at I/ITSEC were two completely different efforts with separate objectives. Due to the requirement to professionally conduct their participation in I/ITSEC '99, the USJFCOM booth had negligible insight / visibility into the Desert Rat operation even though a Common Operational Picture (COP) monitor was desired in the booth. At the same time, the STRICOM support mission required the USJFCOM Desert Rats to devote their full attention and dedicated support to the success of the JTE. In the future, if the USJFCOM booth wants to have a tie with the Desert Rats, additional JWFC Desert Rat personnel would be required, to ensure that the USJFCOM booth personnel understand the JTE objectives and scenario.

y. The JTE was a unique learning experience for the USJFCOM and provided a valuable means for exposing all participants to the Joint environment. What should the future hold for follow-on I/ITSEC JTEs? Additional higher fidelity simulations/simulators versus PC-type simulations. HLA distributed from remote locations to the I/ITSEC floor. Bigger COP with more naval play and a better air picture. More simulations/simulators to expand and increase the realism of the scenario. Expanded "real training" for Active Duty, Reserve, or Guard personnel. Continued USJFCOM presence.

z. Representation from every service needs to be present early and continuously. Early meetings were held in which only one or two services were represented. More participation by experienced Warfighters is necessary to eliminate doctrinal mistakes. Having experienced Warfighters like identified early would have been helpful in creating a more viable scenario. More structured meetings. Submit a framework to follow in advance and groom it over the weeks in advance. Give more Commander's Guidance (ROEs, ATOs, and EOBs) to the operational personnel. Distribute this information prior to I/ITSEC. Train a cadre of individuals from all services to the TDT philosophy and have them run the training evaluation for all of the services.

aa. USJFCOM must be present at the beginning of the planning cycle to ensure that the JTE is "Joint."

bb. Organize the "Planners." Consider establishing sub-committees that meet periodically to address single, very focused portions of the overall JTE. Examples would be to have sub-committees for Scenario and Vignette Development; Training; Visual and Terrain Databases; Exercise Control; Technical Control (Entities); Network Integration (HLA); Visual Presentation To Attendees ("Hollywood Production"); Protocol; Awards; and, Post Event Debriefs. The sub-committees would report-out at the monthly meetings and conduct necessary cross-coordination. Sub-committees should have their own Internet Reflectors so as to conduct coordination between meetings.

cc. Ensure during the early planning cycle that the training devices used in the Joint Training Event are capable of performing the basic functions required of the military mission (scenario and vignettes).

dd. Next year, the "Threat Scenario" needs to be in the Handbook.

10. Specific Lessons Learned -- Overall Scenario and Vignette Development.

a. The participating simulations, to a significant degree, drove the development and construct of the overall scenario and specific vignettes. This resulted in not all Battlefield Operating Systems (BOSs) being adequately represented during the conduct of the exercise. As a result of the lack of some adequate BOS representation, there was a ripple effect on Joint related BOSs.

b. Military SMEs for all BOSs must participate in the scenario and vignette development. The result of not having CSTAR and HMMWV SMEs in the process caused last minute exercise design adjustments at I/ITSEC and just prior.

c. The USJFCOM must be a participant from the beginning to ensure that the exercise is based on Joint Doctrine and conducted to Joint Exercise standards.

d. Each service must provide Subject Matter Experts (SMEs) to ensure that the scenario and vignettes adhere to operational and tactical doctrine. The SMEs should come from the recognized organization of the service for its doctrine (e.g., from the Army - Training and Doctrine Command or TRADOC).

e. An overarching "Theater Scenario" must be developed to give continuity to the vignettes.

f. So as to not cause confusion and in order to publish the JTE Handbook on time, vignettes must be finalized and agreed upon NLT three months prior to I/ITSEC. In order to finalize the vignettes, Military SMEs for all participating simulations must be part of the development from the start of the planning, one year out.

g. Vignettes are "snap shots" of the overall Theater conflict, which continues to be waged during the week allowing for all simulations to participate in at least one vignette. This worked well because not all simulations would be operating during all phases of a JTF operation.

h. The selection of a 30-minute duration for each of the four vignettes was notional based on the estimated time needed to technically prepare prior to the conduct of each vignette session, the time needed to prepare for the Post Event Debrief, the time to conduct the Post Event Debrief, and the desire to end each day NLT 1700 hours.

i. The simulations planned for participation in the JTE need to be identified and committed to the project early. No additional simulations should be added after the vignettes are developed.

j. Capabilities of the individual simulators need to be known to the vignette architects. This would allow a realistic scenario to be designed with minimal surprises later. The visit prior to Workshop #3 to the individual simulators was "worth its weight in gold" in educating USJFCOM personnel on simulator capabilities.

k. Include Under Sea Warfare in the scenario.

l. When writing the scenario, script hard points (i.e., CAP station points) into the MMTT scenario to eliminate having to put them in every computer boot up.

m. Use the BFTT Operator Console to run the scenario within the AEGIS CIC. It will provide a playback for the Post Event Debrief.

n. Each service should have equal representation in the scenario and the vignettes.

o. Each service should have a senior military officer involved in the scenario and vignettes development from the beginning and that person should remain in the position over the 12-month planning and development cycle.

p. In the future, sustain the vignettes in a realistic manner as portrayed in this JTE.

q. Retain the diversity of the vignettes with respect to the mix of equipment, soldiers, sailors, and airmen.

r. Training Within The Scenario and Vignettes. If the simulations operate 100% of the time, there is significant opportunity for geographically separated units to train together (FACs, Pilots, Air Controllers, and Ground Forces) at a real cost saving.

11. Specific Lessons Learned -- Technical Preparation.

a. Participants must identify their specific simulation that will be part of the JTE with technical specification NLT the end of the first quarter.

b. Participating simulations must be "frozen" NLT six months prior to I/ITSEC.

c. The Core Group must test for HLA compliance prior to the I/ITSEC week.

d. DMSO (Contractor SMEs) should be part of the monthly meetings as HLA advisors.

e. Technical Testing At I/ITSEC. The Planning Milestones called for all simulations to be fully tested, as a group, in the LAN by technicians on Sunday, 28 November. Due to the construct of the booths, this Milestone was not achieved. Only limited "ping" tests between simulations were achieved by COB on 28 November 1999.

f. Vignette Rehearsal At I/ITSEC. The Planning Milestones called for a Full Dress Rehearsal on Monday, 29 November 1999 on all four vignettes with all Warfighters at the simulations. This was planned to be completed NLT 1400 hours when the Exhibit Hall opened. However, due to the need to complete Technical Testing, only two Vignettes (#1 and #3) were rehearsed. Additionally, the decision was to continue with testing and rehearsals after the Exhibit Hall opened.

g. Testing. Pairwise Testing was performed with each Federate before integration at I/ITSEC using ModSAF and the HLA Gateway to demonstrate basic connectivity and compatibility with ModSAF. Communications Tests were also performed connecting the three different DIS Radio Models to be used for the JTE. This level of Testing proved to be insufficient. The Tests performed did not adequately represent the conditions found during integration at I/ITSEC. This was largely due to the fact that the very first time everything could be configured and connected together was on the I/ITSEC floor. More extensive Data Testing needs to be performed to ensure that each model communicates valid and appropriate data and very importantly, does not have a degrading effect on other models in the simulation. Log files and automated Test Tools are useful for performing this level of Testing.

h. There was no integration of the system network until setup on the I/ITSEC '99 floor. The JTE Technical Control Group did not know how things were going to work until the day before execution. This is not the ideal solution for something this complicated. The Desert Rats did not get a chance to run all vignettes at least once. Only Vignettes #1 and #3 were conducted prior to the actual vignette schedule. There is a need for earlier integration of systems. For next year, the leadership should not be too optimistic with the current set-up schedule / technical tests based on so many unknowns.

i. There is a lot more to HLA interoperability than just using the same enumerations and setting the RTI. There needs to be better test tools available prior to integration so as to test beyond the "lets all agree about data."

j. All of the platform simulators were converted DIS simulators and as such did not take full advantage of HLA. As such, the JTE was not a "final" fair test of the HLA performance.

k. Need to develop a more robust method for doing pre-OCCC integration testing. Some systems performed fine when taken to Lockheed Martin. However, when combining simulations in a larger federation, there were network integration

problems.

12. Specific Lessons Learned -- JTE Exercise Conduct and Control At I/ITSEC (Warfighting, Training, and Technical Aspects).

a. On the average, it took two hours of technical preparation time before each vignette to get the participating simulations onto the JTE Federation Network and ready to be handed-off from Technical Control to Exercise Control. This needed preparation time was reduced to 45 minutes by the end of Vignette Four.

b. Technically, tactically, and from a training standpoint, the vignettes could have exceeded more than 30 minutes. "Free Play" was conducted during two vignettes when the battle progressed faster than anticipated. Once on the Network, the federation did not experience any problems due to duration (see below for other technical problems noted).

c. Technical Control Tools. There were not enough sufficient tools available to get a 100% count of the entities being employed during a given period of a vignette. This resulted in Technical Control not being able to determine when a failure may occur and be prepared to take steps to ensure the vignette continued. On one occasion however, the Technical Control Group was able to estimate when maximum entities was being reached and did indeed take corrective action seconds before a major "crash" of the system.

d. Vignette Matrix. This matrix in the Controller's Handbook was invaluable to the Technical Control Group when minute-by-minute decisions had to be made during the last seconds before STARTEX. The matrix allowed the Technical Control Group to determine whether to allow a certain simulation to participate in the vignette and delay the start time (because of its importance) or to disallow participation based on its restricted role.

e. Technical Analysis and Collection Effort. There was no time available for the Technical Control Group to collect lessons learned as they occurred due to the fast-paced event and enormous technical work to get the simulations to interoperate. There needs to be an independent Collection and Analysis Group established from the start that consist of at a minimum, one Simulation/HLA Network SME and one Military SME (knowledgeable in use of simulations during exercises and mission rehearsals).

f. Technical Connectivity Issues Concerning Simulators Joining The Network. Every simulator that came to I/ITSEC deemed "HLA Compliant", individually was able to join the HLA Network. However, not all simulators could join all the time together and a certain order of joining was necessary. This Network Connectivity Issue prevented some simulators from joining the exercise in HLA and had to be brought in through DIS and the Gateway. Why? Because by default, HLA Runtime Infrastructure (RTI) 1.3 forms TCP communication connections between all simulations. This requires that all machines can connect to each other (TCP/IP). The default configuration of HLA RTI 1.3 exists because it reduces latency between simulations and prevents bottlenecks for reliable (TCP) communications.

In some cases, the connecting simulation operated at different speeds.

g. Reconfiguration To Workaround Connectivity Issues. The Technical Control Group reconfigured the RTI to limit the TCP Connections that were created. The Network had ~30 machines which would take a long time to Test Point-To-Point Connectivity for all machines. Instead of Testing all Network Issues, the Technical Control Group limited the connections required which enabled it to test the Configuration and execute the exercise. The simulations were connected directly to the RTIEx. This procedure reduced the time before the RTI issued warnings about Federates, which were not responding to joining the Network. This resulted in eliminating the problem encountered by reducing time management and allowed most simulations, in most of the vignettes, to join the exercise.

h. Runtime Infrastructure (RTI) Ticking. The HLA RTI, being a shared resource among federates, presents a problem for the engineering practice of Testing and Integration. Methods for Ticking the RTI to collect and distribute data varies from federate to federate. A federate's RTI Ticking method also has an effect on the RTI's ability to maintain communication with other federates. The result of this situation led to problems with the order and number of federates joining the I/ITSEC JTE Federation. Consequently, some of the federates, during some vignettes, were required to change their network interfaces to run DIS and connect to the I/ITSEC JTE Federation through the STRICOM HLA Gateway. A framework for managing and analyzing RTI connectivity needs to be developed such that disparate simulations can effectively federate within the performance limitations of the DMSO RTI.

i. Technical Issue Needing Investigation -- NICs. The Technical Control Group identified some NT machines with two NICs that were not configured to send or receive multicast data over HLA. Fixes were made to the configuration of the machines. This issue needs to be addressed before machines arrive at I/ITSEC.

j. Technical Issue Needing Investigation - Flow of Multicast Data. The Technical Control Group estimates that some multicast data was not getting routed to all machines during all vignettes. The Control Group initiated a Test Program to identify the suspected connections. This needs to be done prior to the first vignette either on Sunday or Monday for next year's I/ITSEC.

k. DMSO RTI 1.3v6 was used during the vignettes. Next year, participants recommend considering using a commercial version of the RTI.

l. JECG Visuals. The 3D Stealths and ModSAF PVD worked well for control of the exercise. Future consideration should include separate 2D and 3D representations for the Air, Ground, and Naval battles. Additionally, there should be a separate Tactical Display for the JTF Commander representing GCCS, CGS, and JSWS.

m. HLA Technical SMEs. Immediately prior to the start and during each of the vignettes, there needs to be a group of HLA Technical SMEs free of specific responsibilities and ready to move throughout the Exhibit Hall to work problems

that occur without warning.

n. MELIOS Simulation Value by U.S. Marines. The JTE was a powerful application of training devices within a "training environment." This may have been the first time that Marines have been able to practice Close Air Support (CAS) in a synthetic environment. It is critical for this practice because for Marine Air, CAS support to Marine infantry is its number one mission. There is currently no available means for Marines to practice CAS outside of live training exercises. This JTE demonstrated that in the future, Forward Observers and Forward Air Controllers can initialize a MELIOS somewhere in Camp Lejeune and two pilots can strap into F/A-18 trainers at Cherry Point and all achieve immediate training that would normally take a week to accomplish in a live training exercise. Additionally, this critical training will be able to be accomplished regardless of bad weather (fog, rain, or snow), without expending valuable resources (fuel or bombs), without post flight maintenance, and participants will be able to correct errors during the training exercise as each occurs.

o. Arriving on Saturday while the simulations were being unpacked was useful for the USJFCOM Desert Rat personnel, since none had been to I/ITSEC. However, it should not be required next time if the same personnel are used. Sunday arrival will suffice with the same personnel, since the interaction between operations and the technical staff is invaluable. Sunday arrival will help to build better situational awareness of the participants for the control personnel as technical testing / set-up is occurring at this time.

p. Video media clips was a good way to kick off the Conference and each vignette (great crowd draw). Need to be able to broadcast over the conference center PA system when an event is about to start to get everyone (audience) on the floor engaged/ready. Placing video on CD-ROM facilitated being able to show the video at distributed booths. Need a better speaker set-up in the JECG booth to increase sound, fidelity of video, and voice.

q. Conference room (Desert Rats Command Post) was essential. Necessary area away from I/ITSEC floor for Desert Rats participants to prepare briefings, de-briefings, and meetings. Need to be able to maintain a presence at the JECG booth at all times. However, when an event ended and everyone regrouped for the debrief, the JECG booth was left nearly empty.

r. Operational mission pre-briefs for each vignette are required because each adds realism. Each also provided operational participants with a familiar forum for preparing to execute their portion of the vignette. Having each service brief their specific area of the JTE worked well. It focused participants on their role during each vignette. It also helped to ensure that vignettes were understood and executed properly. Further, it provided a forum for deconflicting airspace and addressing other operational issues. At times, it would have been useful to have a knowledgeable technician available at the operational briefings to answer technical questions.

s. A uniformed, military narrator is essential to keep the spectators informed as the

activities occur. Many spectators are not accustomed to JECG operations. The narrator helps draw attention to the vignettes as they are being executed. The narrator needs to avoid being tied to one individual in the audience at the expense of the overall event.

t. There is a need for a Common Operational Picture (COP) which is large enough to show the entire air picture. There was not a true COP because the one in place did not show the naval picture and only displayed a very limited air picture. There will probably be a need for two COPs next year. One will be needed to show the "close-in" ground picture and one for the broader Naval/Air play. A dedicated "COP Display Manager" would be very useful to the demonstration. This individual could also be used as a "Logger Manager" to ensure significant events are recorded for the Post Event Debrief.

u. The logger functions were not used to their peak efficiency during the JTE. Converting the logger information into the CD ROM format took longer than anticipated. The PC support capability provided in the lecture hall was not able to handle the large logger files. Numerous logger tools were available, but were not fully utilized. There is a need to better integrate the tools available into next year's event.

v. Rehearsals of the vignettes are important to help ensure success on the floor in front of an audience. Need to practice, at a minimum, the easiest and the most difficult vignette (s) prior to execution. Suggest starting with the easiest first to build confidence / success in the system.

w. A common clock, preferably as part of the HLA, would facilitate start-up, ending, and workarounds, as needed.

x. Pass all required information (IFF, ESM, etc) over the network for realistic control/identification of aircraft. This will increase the entity count, but it also represents the next level in the crawl, walk, run philosophy. Use operational personnel as OPFOR.

y. Evaluate console needs for the Multi-Mission Team Trainer (MMTT) and add consoles as appropriate (at least one more for these same scenarios). Add a ship-based helicopter for Over the Horizon (OTH). Physically separate the MMTT Technical Console from the Warfighters. The console operator will control the OPFOR and the Ship Based Helicopter. An extra individual will be present to assist with guidance and communications.

z. Pass tactical data over large screens in front of all booths and with a moderator telling what is going on. Put an interconnected overhead display in all booths controlled by one station to show run-time or have coordinated clocks at every station.

aa. Ensure start-time is known to all operators.

bb. Need to stress training for next year. The focus should be to use the technology

to support the training and not visa versa. Each service should have a single person designated to develop their training strategy and have it integrated into a Joint Training Strategy that builds from service METLs to JMETLs within the overall scenario. Recommend Psycho Rat take the lead for I/ITSEC 2000.

cc. On the I/ITSEC floor, at each participating organization, place a large visual display identifying the Desert Rats participant.

dd. At the JECG, place a large "Roadmap" that shows where the Desert Rat participants are located on the Exhibit floor. Consider coordinating with the I/ITSEC committee to give historical military names to the walk-ways on the Exhibit Floor and publish a map in the handout given to each attendee. This will assist attendees in finding all of the Desert Rats participants.

ee. Decentralize all training devices and construct one large Joint or Combined Operations Center with chairs (viewers), speakers, and six large screens. Two screens should be provided for each battle space (land, air, and sea). One of the two screens would be "stealth" and the other an "overlay" of the battle space.

ff. Expand the Joint Training Event to include Combined Operations with Allied Forces (such as Great Britain and Canada) which participates in I/ITSEC.

gg. Retain the "CNN like" Newscast for each vignette because it set the tone for the battle and gave the viewer valuable information so as to understand what was about to occur in the vignette.

hh. Provide a questionnaire to the attendees and ask for their comments. Have a person "roaming" the I/ITSEC Exhibit Hall asking and recording comments from attendees. Do this at the JECG as the vignettes take place. Immediate feedback by the attendees is the best means to collect "unfiltered" input from the general audience.

ii. All aircraft simulators should have the same operational capability.

jj. Aircrews should be able to fly simulated what they do in the real world.

kk. In the future, if the exercise can have classified databases, a more robust threat scenario should be included addressing the threat order of battle.

ll. A big Chronometer Clock with a sweeping second hand is needed in the JECG for Time Hacks and keeping track of the Vignette Timelines.

13. Specific Lessons Learned - Vignette #1 (Counter-Recon / Close Air Patrol).

a. HLA implementation of each simulation caused additional time to join the Network resulting in the Vignette starting 10 seconds late. Close and continuous Federation management was necessary leading up to handoff to JECG by Technical Control. Once the Federation was established, very few technical problems were encountered.

- b. The Barco Speakers in the JECG (Army Booth) were not loud enough for the audience to hear the communications taking place in the battle.
- c. The I/ITSEC audience did not clearly understand what was taking place in the Vignette. Prior to the next Vignette, a PA System was added to the Barcos and the Military Chief of the JECG from USJFCOM explained what key aspects were taking place in the Vignette battles.
- d. There was a need to synchronize Time-through Hacks prior to STARTEX. This was needed for both the Technical Control Group and the JECG.
- e. Hand-off Decision Point. At E-20 minutes, the "Go-No Go decision" for an on-time scheduled start was required to be made for each vignette. This 20 minute out decision point worked well and was necessary based on the need to finalize bringing simulations onto the Network and to get the Vignette Video prepared which had to immediately proceed the Vignette STARTEX.
- f. There needs to be criteria established for broadcast freezes.
- g. There was a communication break between the CIC and Higher Authority. Potential breaks in Tactical Communications requires the need for future Rules of Engagement (ROEs).
- h. There is a need to conduct a technical check on the number of frequencies that can participate in a vignette.
- i. U.S. Navy. Had Tactical Communications outages. Ghosts existed for surface and low altitude aircraft over landmasses. There were problems controlling the SU-27 OPFOR and getting it at the proper engagement altitudes.
- j. U.S. Marine Corps. Had problems establishing Tactical Communications between different types of aircraft simulators. The Marines also had problems keeping Rotary Wing aircraft out of friendly artillery fire.
- k. U.S. Army. The Close Combat Tactical Trainer (CCTT) HMMWV simulator would not allow the dismount of the Scout conducting forward observations of the battlefield. This required the observation from inside the vehicle resulting in the personnel not being able to see the East Battle. The result was a reduced training session and reduced interaction between Joint simulations and participants.
- l. U.S. Air Force. Had problems maintaining Tactical Communications with the Hornet. Needed additional SU-27 targets after destroying OPFOR. Had a technical problem getting one missile away.

14. Specific Lessons Learned - Vignette #2 (Defense / Rear Area Operations).

- a. The Network improved in this Vignette over the first primarily because of the lessons learned by the Technical Controllers.

- b. Lost the HMMWV which dropped out of the federation without knowing why.
- c. Coffee spill killed Tactical Communications in the CIC during the Vignette. Keep beverages and food away from the computers.
- d. Could not see bombs dropping in the JECG which caused a problem in timing the delivery of the WP onto the battlefield.
- e. Some simulators did not see the OPFOR tanks.
- f. Communications was sporadic.
- g. Timing between the Stealth and ModSAF was a problem.
- h. Using a mike and a speaker to narrate what was occurring in the Vignette went smoothly and enhanced viewer understanding of the battle. Tactical Communications became louder which helped for better control in the JECG.
- i. U.S. Navy. Watch Stations Comms for Engagements, Greywolf Comms, and Air Activity Oversight was good. Tactical Comms was up and down. Inputting threat targets and team supportive behavior with CIWS/Chaff was poor.
- j. U.S. Marine Corps. The scenario ran as scripted. The time hack was good. MELIOS passing of information to the Hornet and artillery was excellent. Negative was that MELIOS had to go DIS vs HLA, the visual systems reduced training value, and Hornet 22 was blind and could not see tanks or smoke (could see before STARTEX).
- k. U.S. Air Force. Positives were that all visuals worked and all simulators worked. On the negative, Air Force pilots were not receiving Comms from other services, there were problems with the weapon release systems of the simulators, and Air Force pilots were undertasked in the Vignette by an insufficient number of OPFOR aircraft - No Air Threat!
- l. U.S. Army. Negative. The HMMWV dropped off the HLA Network without warning. "Desert submarines" appeared in the HMMWV simulator without warning. The MOUT Monitors were too small and they need to be elevated. For Army Air there was neither field of view nor zoom, which was therefore not doctrinally correct. Additionally, there was no grid readouts provided or aiming points for weapons. Good. Train-up of the University of Central Florida (UCF) ROTC Cadets on using DISAF and the CCTT simulators went very quickly. The Cadets are "in the computer age" and easily learned the functionality of the simulators. Because the Infantry School's Ranger Cadre was present, training was able to be accomplished with the Cadets even after the HMMWV simulation dropped off the HLA Network, cross-training with the Cadets went well, and communications worked well. For Army Air, the AH-64 simulator was a very reliable system and provided great training for the UCF ROTC Cadets from the standpoints of familiarization with helo simulations. The tactical communications

between the AH-64 and the F-16 in a real live environment was excellent.

15. Specific Lessons Learned - Vignette #3 (Battlefield Preparation and Movement To Contact).

- a. Tactical communications remained a problem.
- b. Communications recovery was improved as members of the JECG and the Services began to understand the problems and established workarounds.
- c. The narration of the Vignette was again excellent.
- d. Switched to reliable distribution of MOM Data, which worked well.
- e. CCTT-ModSAF interaction using the Bridge Federate performed very well.
- f. Ability of industry and military personnel to fix simulator problems on the floor greatly increased success of the entire JTE Federation.
- g. Network problems experienced at the end of Vignette #3 was possibly due to increased entity load affecting the simulations and their ability to interoperate.
- h. U.S. Army. Negative. The Vignette did not challenge the Army for the full 20 minutes and the tactical Comms being down was a training distracter. Good. The UAV and JSTAR coordination during the Vignette was super! Smoke was excellent for the 2d battle run of the Longbow.
- i. U.S. Navy. Negative. Comms for the single watch station. Good. Final engagements.
- j. U.S. Air Force. Negative. INS, Comms, and weapons release continued to be problems. Good. Air-to-Air operations and training.
- k. U.S. Marine Corps. Negative. Comms and #2 birdie/no marks. Good. Smoke, visuals, and timing for bandits.

16. Specific Lessons Learned - Vignette #4 (Meeting Engagement)

- a. At the JECG, there was no feature for the USN.
- b. Tactical Comms had the same problem.
- c. Need a manager in the JECG for each Barco medium.
- d. Need separate Air and Ground "COPs" in the JECG.
- e. Technical Handoff to Operational Control was well coordinated and excellent resulting in an immediate capability to "jump" into the Vignette.

- f. Untested scenario yields unexpected technical data.
- g. Federate order of joining is a HLA dependency.
- h. More walkie-talkies are needed (one per federate needed).
- i. Tech Control was able to reduce the time to have the Federation up and running from two hours in Vignette #1 to 35 minutes by end the of Vignette #4 due to lessons learned.
- j. The C4I simulation played by the FBCB2 was very well exercised, technically.
- k. Anti-static spray is needed in the JECG to alleviate communication problems.
- l. U.S. Navy. Negative. Restoring casualty operations, internal CIC Comms, and realizing MMT Training benefits. Good. Technical problems being worked faster and more efficiently, multiple watch stations with "on-screen-up" and training revealed watchstander limits.
- m. U.S. Marine Corps. Negative. Overload of data and Comms continued to be up and down. Good. Visuals (smoke), ability to exercise CAS with ground (Infantry), and CAS performances.
- n. U.S. Air Force. Negative. Comms with CIC. Good. Backup GCI and Deep Strikes worked as planned.
- o. U.S. Army. Negative. The JSWS was not displayed to its full capability. The UAV had Desert Sub visuals again instead of T-72s and the visual feeds were poor. The CCTT fell off the Federation Network again without warning. Good. 100% of the training objectives with UCF ROTC Cadets were achieved and the JSWS was, for the most part, good. Queuing of the UAV was also good. The HMMWV worked well, as planned, when it was on the Federation.

17. Communications.

- a. Communications Plan. A matrix of tactical communication available for use through the simulations was developed early in the planning process. Additionally, a matrix of simulation that must communicate with each other was also developed. This proved most important in identifying communication requirements.
- b. A Technical Communications Net was established using Motorola Hand-Held Devices. These devices worked well and were absolutely necessary in getting all simulations onto the LAN during the vignettes and during testing. However, communications procedures were not pre-established causing much time being devoted to this problem during I/ITSEC in order to establish corrective measures.
- c. Tactical Communications for certain simulations failed repeatedly. There were no backup communications. The next JTE lead official should consider Hand-held devices for a Tactical Backup Net.

d. Tactical communications are required. Added realism. Provided the Joint interface for the simulator operators at a tactical level. Very useful tool to control the event as it progressed (when working).

e. Tactical communications speakers need to be placed 5-10 feet high to allow all spectators to hear the communications. Tactical communications need to be more reliable next year. Anti-static spray helped solve the problem. However, a better solution needs to be found prior to next year's event.

f. Possibly a complete back-up tactical communications net will be required, as the events become more complex.

g. Walkie-talkies worked well for the Technical Control Net. However, all personnel need to be equipped with headsets to overcome the noise level in the hall. Two walkie-talkies per booth (one for operations personnel and one for technical personnel) or at least one for each simulation in each booth (some booths had more than one simulation in them) may help the Technical Control Net. The size of the walkie-talkie provided was excellent for use in the JTE.

h. Use a Communication Station as the reporting senior. Play communications in front of all booths for audiences.

i. Headsets are needed for the Technical Communications Net.

18. Post Event Debriefs, Closing Ceremony, and Awards.

a. Preparation Time. From the end of a vignette to the start of the Post Event Debriefs, the participants had 1.5 hours of time to prepare. This was not enough time to determine what to "play back", key points to be made by each participant, or time to word process the briefings onto a computer for presentation.

b. A person needs to be designated as a recorder of Q&As during the open session with the audience.

c. Video taping of the Debriefs for capturing of Lesson Learned discussions should be considered.

d. The amount of time used for each Debrief of about one hour was judged adequate as most attendees remained to the end of the session.

e. The first Debrief did not proceed as smoothly or as fast as the remaining sessions as the JTE was learning as it conducted the Debrief and there were repeated Lessons Learned discussed. The JTE had planned to conduct a rehearsal of the Debrief but did not have time. The rehearsal should be considered for next year.

f. Closing Ceremony. Needs to be rehearsed with all key VIPs. More time before the start from the last vignette is needed to prepare the room and participants.

g. Awards. Specific names of awardees should be determined ahead of time and those personnel should be assembled prior to the start. Missing organizations should be recognized and noted as not being able to attend as opposed to not knowing their status until called upon.

h. A standard format for Debriefs should be implemented. Part of it should include what training got accomplished.

i. Have brief more real time. Collect inputs on station and proceed immediately to the debrief room. Try to drag audiences directly from the event to the Debrief.

j. Show audio/visual replay during the Post Event Debriefs. Use BFTT/MMTT for tactical replay.

k. A separate "Moderator" should run the show during Debriefs. During the vignettes, he should have no other job except to collect information and start to develop the Post Event Debrief as the vignettes unfold.

l. There should be a template for the military portion.

m. The technical lessons learned should be presented in 10 minutes for each session. For the first session, describe the architecture of the federation.

n. For the last Post Event Debrief, hold it in the evening (1900). Provide lessons learned associated with building the federation.

o. Must have the visual reply for the military AARs.

p. There must be identified, from the beginning of the planning cycle, which will be the "Chief Trainer." This person should lead all coordination for the development of the training portion of the Post Event Debrief.

q. Consolidate the formal end of mission debriefs into one overall mission debrief at the conclusion.

r. Formalize the Mission Pre-briefs, Post Mission Debriefs, and Post Event Debriefs to reduce the time in the meetings. It seemed to be "death by meetings."

19. Terrain and Visual Databases.

a. Lateness of the decision on the terrain database was almost a showstopper. Need to identify database earlier for next event.

b. Written permission from the government agency owning the Terrain Database to be used must be done NLT six months prior to I/ITSEC due to the long lead-time to gain approval.

c. Used the Mod IOS screen, which only had the National Training Center (NTC) database showing the Fort Irwin, CA area. Unable to show the air picture due to

limited size of the database.

d. Database distribution and release issues need to be worked out within the first month of planning so all services know what will be available during the JTE.

e. Need to have all visual databases tested to ensure that all simulators scheduled to use each can indeed interoperate with the visuals.

20. Resource Management.

a. The conduct of the JTE required STRICOM resourcing in three major categories: Terrain Database development, Technical Integration (HLA/DIS/Gateway Development), and Employee Salaries.

b. As a first year event, a good ROM was difficult to develop at the outset for the Terrain and Integration areas.

c. As the requirements for the development of the Terrain Database became clearer as the scenario and vignettes were finalized, the cost to produce the database increased.

d. The true cost of each JTE must be captured. Leveraged contracts and opportunities to save resources must also be captured as lessons learned.

e. Each organization's "in-house" cost beyond that of a "normal" I/ITSEC must also be captured.

